REMARKS

The Final Office Action mailed on December 7, 2005, has been reviewed and the comments of the Patent and Trademark Office have been duly considered.

By the present amendment, applicants have rewritten or cancelled their claims to define the invention more particularly and distinctly so as to overcome the technical rejections and define the invention patently over the prior art.

Prior to this amendment, claims 3, 5, 6, 11 and 19-29 were pending in the application. By this amendment, claims 19-29 are cancelled without prejudice or disclaimer, and new claims 30-31 are added.

Applicants respectfully submit that the present application is now in condition for allowance for the reasons that follow.

CLAIM REJECTIONS DUE TO IMPROPER SPELLING

In the Final Office Action of December 7, 2005, claims 21-24 and 27-29 were objected to because of improper spelling. Applicants apologize for their lack of attention to spelling rules. Claims 21-24 and 27-29 have now been cancelled thus rendering the objection immaterial, while applicants have been wary to ensure the vocable 'preforms' in their new claim 30 is spelled correctly.

CLAIM REJECTIONS UNDER 37 CFR 1.75

In the Final Office Action of December 7, 2005, claims 25 and 27-29 were anticipatively objected to for substantially duplicating claims 21-24. Claims 25 and 27-29 have now been cancelled thus rendering the objection immaterial.

CLAIM REJECTIONS UNDER 37 CFR 1.75(c)

In the Final Office Action of December 7, 2005, claim 26 was objected to for being in improper dependent form. Claim 26 has now been cancelled thus rendering the objection immaterial.

CLAIM REJECTIONS UNDER 35 U.S.C § 103

In the Final Office Action of December 7, 2005, claims 3, 5, 6, 11 and 19-29 were rejected as being unpatentable over Reiber et al (US 6,354,479) in view of Perlberg at al (US 5,421,503).

Applicants respectfully traverse the rejection based on following facts:

The Examiner's assertion that Reiber discloses a method for producing ceramic bonding tools (OA Page 2, line 25) must be taken in a semantic context.

Strictly speaking, Reiber does not teach a method for producing ceramic bonding tools *per se*. What Reiber explicitly and unambiguously claims is a method to produce a bonding tip having specific electrical properties, distinctively an electrical resistance within the range of 10^5 to 10^{12} ohms, a range which Reiber deems optimal.

Neither the method of forming such tool nor its particular shape, including the profile of its tip or the diameter of its borehole are of the least concern to Reiber, nor do they constitute the subject of his invention. Reiber's invention is entirely independent of the dimensions of his bonding tips, which can have large or small boreholes.

Consequently, a person of ordinary skill in the art, seeking out the benefits of the bonding tools or blanks for tools of reduced dimensions of the present invention, would not have the slightest motivation to turn to Reiber, as the latter is utterly unable to oblige.

Reiber also doesn't care how his ceramic bonding tool tip is formed, i.e. it can be molded, cast, machined or even sculpted for that matter, so long as its electrical resistance is within the claimed optimal range. Hence, the electrical resistance of Reiber's bonding tip becomes the essential, *sine qua non* attribute of Reiber's invention.

In order to achieve this objective, the very essence of his invention, Reiber must either

1. impart the deemed optimal electrical resistance by doping, coating, ion implantation, chemical vapor deposition, electro-plating or neutron bombardment to a ceramic bonding tip which, initially, lacks these optimal electrical properties, or

2. form his ceramic bonding tip from a material that already inherently possesses the deemed optimal electrical resistance.

In the first case, Reiber can easily obtain such a precursor ceramic bonding tip from any commercial bonding tool manufacturer in the market. If Reiber would attempt to produce such a precursor ceramic bonding tip himself he would be wasting his time outside the scope of his technical expertise.

Thus it is only in the second case, the one in which the ceramic bonding tip is made from a material which already possesses the deemed optimal electrical resistance, that Reiber needs to concern himself with the forming method. Reiber cites four of these, namely molding (Reiber's claim 20 - Col 7, lines 22-23), hot pressing, (Reiber's claim 21 - Col. 7, lines 24-25), fusion casting (Reiber's claim 22 – Col. 7, lines 26-27) and machining (Reiber's claim 32 – Col 8, lines).

It is plain that these forming techniques are only cited *en passant* as 'potential' forming techniques none of which *per se* are the substance of Reiber's invention. Clearly, Reiber does not teach a method for hot pressing nor fusion casting of ceramic materials

let alone bonding tips, even assuming, *arguendo*, that such techniques could be applied for such purpose.

Neither is Reiber a method for injection molding ceramic bonding tips. When Reiber claims that his dissipative bonding tip can be formed by (Claim 20, Col. 7, line 23)

'[...] *mixing, molding and sintering reactive powders'*

he merely refers to the prior art technique of ceramic injection molding in general. Such a summary and generic process description would clearly not be sufficient to allow a person of ordinary skill in the art to produce the bonding tools or blanks for tools of reduced dimensions the object of the instant invention.

Furthermore, it is to be noted that, where Reiber claims a molding technique can be used to form his dissipative bonding tips, he describes his technique as (Claim 31, Col. 7, lines 64-67):

'[...] *mixing fine particles of a composition appropriate for forming said dissipative material with a solvent, a dispersant, a binder, and a sintering aid to form a mixture;* [...]

The Examiner's suggestion (OA Page 3, lines 2-3 and Page 4, lines 12-13) that the organic constituents of Reiber's molding composition can be equated with the degradable thermoplastic organic material(s) of the instant invention is, with all due respect, fallacious.

If a person of ordinary skill in the art were to attempt to produce the bonding tools or blanks of reduced dimensions of the present invention using Reiber's invention, Reiber's solvent would, from the moment it is admixed to the thermoplastic compound, start dissolving any soluble organic constituents present therein, viz. oils, greases and

waxes, and thereby inevitably and irremediably degrade its chemical and rheological properties while disturbing the ratio of the accurately determined volume of sinterable particulate material or materials to the accurately determined volume of thermoplastic material or materials essential to yield the tools or blanks of reduced dimensions of the instant invention.

The Examiner pertinently observes (OA Page 3, lines 3-6) that Reiber must of necessity predetermine the amounts of material in order to obtain the composition of his bonding tip. While this is obvious, it is one thing determining the amount, which in Reiber's case represents the **mass** (emphasis added) of the individual ingredients, i.e. so many grams of ceramic powder, so many grams of such or such organic material, etc., that go into his mixture, realizing all along that the degree of accuracy in performing such mass determinations will inherently affect the accuracy of his end composition, it is quite another to accurately determine the ***volume*** (emphasis added) of the sinterable particulate material or materials and the ***volume*** (emphasis added) of the thermoplastic material or materials in view of generating a predetermined shrinkage upon sintering, as taught by the instant invention.

Reiber has no need to perform any volume determinations of his ingredients in order to produce his dissipative bonding tips.

Applicants recognize that they may have been somewhat lax in failing to emphasize sufficiently this important point in their now cancelled claim 19(b) which read:

19(b) mixing an accurately determined volume of said sinterable particulate material or materials with an accurately determined volume of said thermoplastic material or materials to form a thermoplastic compound,

Hence, in this amendment, applicants have cancelled their claim 19 and replaced it with their new claims 30 and 31, in which the ambiguity has been clarified.

It will be expressly noted that in doing so, applicants have not introduced any new matter since the wording used in their new claim 30 has been sufficiently and explicitly presented in more detailed form in at least two places in their disclosure, viz.

(Publ. US 2002/0158374 A1 – Page 4, Col 1, lines 17-24, § [0049])

What is crucial for this invention is that the exact volumetric ratio of discrete phase to that of the thermoplastic compound be established with the greatest possible accuracy so that the shrinkage upon sintering can be determined with great precision in accordance with the teachings of the inventors' co-pending patent application Ser. No. 09/962,526 entitled: Method For Controlling The Dimensions Of Bodies Made From Sinterable Materials.

(Publ. US 2002/0158374 A1 – Page 4, col. 2, lines 19-25, § [0056])

This green insert 62 is subsequently dewaxed and sintered during which it shrinks by an amount which will have been accurately predetermined in accordance with the teachings of the present inventors' U.S. patent application no. 09/962,526 entitled: 'Method For Controlling The Dimensions Of Bodies Made From Sinterable Materials'

Finally, Reiber is unable to work with metals nor does he claim he can, whereas applicant's invention includes the use of metal, ceramics and mixtures of these.

It is clear from the foregoing that is simply not possible to produce the tools or blanks of reduced dimensions of the instant invention using Reiber. Neither is there anything in Reiber that would instigate a person of ordinary skill in the art to attempt such use.

Now, let us turn to Perlberg at al (US 5,421,503).

With all due respect, the Examiner's assertion (OA Page 4, lines 2-5) that 'Perlberg notes that the diameter of the borehole is depended on the size of the wire running through the bonding tool, see col. 3, lines 23-31' is lopsided.

In the cited passage, and referring to Perlberg's FIG. 3, Perlberg merely confirms the existence in the semiconductor wire bonding industry of a traditional, empirical borehole (H) to wire diameter (D) (latter notation applicants') of 1.5, or, in mathematical terms:

$$H = 1.5 * D$$

This relationship can be read from left to right or from right to left, i.e. the borehole diameter is H is a function of the wire diameter and vice versa.

In Perlberg's invention (Col. 4, TABLE 1), this size ratio has been brought down to 1.2, which is generally accepted as today's practical limit. Any smaller ratio than 1.2 would result in excessive drag on the wire between the first and second bonds.

In the practical world of the semiconductor industry, it is not the bonding wire diameter which dictates the borehole diameter but rather the opposite. Reducing the diameter of the bonding wire is not an issue as bonding wire can be drawn to almost spider silk thickness. But this would require that the borehole diameter follow suit which is precisely where today's semiconductor industry is stuck, with the smallest boreholes achievable being approximately 0.9 mils (22.86 micrometers) in diameter (Perlberg, Col. 5, lines 4-6).

Perlberg offers no suggestions for reducing the dimensions of his wire bonding capillary and in fact recognizes the weakness and limitations of his invention when he states (Col. 5, lines 22-33):

"Thus, the limits for fineness of close pitch tools are affected by wall thickness (WT) of the materials used to make the capillaries as well as the bonding strength of the bonded wires. As higher strength materials become available, it may be possible to reduce wall thickness of the bonding tools. This would not affect the minimum area of working face required to make strong bonds, but could affect reliability and longevity of the tools. Further, there is presently a limit to the reduction of wire size which is near 1.0 mils in diameter if problems of wire movement during packaging are to be avoided."

In other words, Perlberg's capillary cannot use wire that is substantially smaller than 1.0 mil in diameter. It is not that such wire is not available or cannot be produced, but only that Perlberg's capillary cannot work with it.

Perlberg's hope that – maybe one day – stronger materials may become available and only then could his wall thickness be reduced to below 2.0 mils, clearly means that for the time being at least, he is limited by this minimum wall thickness of 2.0 mils. In fact, he has turned this limitation into his Claim 9 which reads:

"9. A fine pitch bonding tool as set forth in claim 7 wherein the wall thickness of said working tip is larger than 2.0 mils in thickness."

Perlberg offers no suggestions nor incentives for reducing the borehole diameter of his capillary as, in any case, his admitted minimum wall thickness severely restricts the amount by which the bonding pitch can be reduced.

Through the application of the instant invention, all dimensions of the bonding tool or blank for bonding tools - including the borehole diameter, wall thickness and bottleneck width - can be scaled down simultaneously, resulting in a miniature of the original green capillary. Such a miniature capillary can be used with a correspondingly smaller bonding wire and allows for a correspondingly reduced bonding pitch, which is what the semiconductor industry has been waiting for.

CONCLUSION

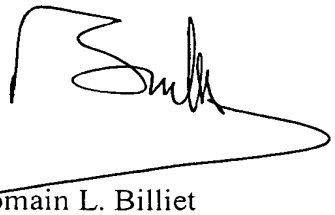
For all of the above reasons, applicants submit that the specification and claims are now in proper form and that the claims all define patentably over the prior art.

Therefore, applicants submit that this application is now in condition for allowance, which action they respectfully solicit.

CONDITIONAL REQUEST FOR CONSTRUCTIVE ASSISTANCE

Applicants have amended the claims of this application so that they are proper, definite and define novel subject matter which is also unobvious. If, for any reason this application is not believed to be in full condition for allowance, applicants respectfully request the constructive assistance of the Examiner pursuant to MPEP § 2173.02 and § 707.07(j) in order that the undersigned can place this application in allowable condition as soon as possible and without the need for further proceedings.

Respectfully submitted,



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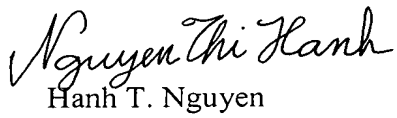

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March 6, 2006 ----------

Romain L. Billiet, First Applicant